

07/27/00

07-28-00

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ASSISTANT COMMISSIONER FOR PATENTS  
PATENT APPLICATION  
Washington, D.C. 20231

DOCKET NO. JP9-2000-0176US1  
Date: July 27, 2000

JCS82 U.S. PTO  
09/626945

07/27/00

Transmitted herewith for filing is the Patent Application/ of: under Rule 1.53(b)

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For: AN AUDIO SUPPORT SYSTEM FOR CONTROLLING AN E-MAIL SYSTEM IN A  
REMOTE COMPUTER

Enclosed are:

☒ 4 Sheets of Drawings.

☐ An assignment of the invention to International Business Machines Corporation, Armonk, New York 10504.

☐ A certified copy of a \_\_\_\_\_ application.

☐ Declaration and Power of Attorney.

☐ Associate Power of Attorney.

☒ Information Disclosure Statement with form PTO-1449 with references attached.

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Express Label EL600330578US  
Date of Deposit: July 27, 2000

## AN AUDIO SUPPORT SYSTEM FOR CONTROLLING AN E-MAIL SYSTEM IN A REMOTE COMPUTER

### Field of the invention:

- 5 This invention relates to an audio support system for controlling an e-mail system in a remote computer.

### Background of the invention:

10 E-mail systems are becoming all pervasive as communication mechanisms, especially with the rapid increase in the use of computers and the internet. The existing e-mail systems provide a number of features to facilitate communication. However, these e-mail systems are not very friendly for people with disabilities, as these systems require the user to be in close proximity with the computer containing the e-mail system. It is desirable in situations  
15 involving people with disabilities to have a means for accessing the e-mail system remotely and in particular through a voice input mechanism.

20 The voice recognition systems are also known. These systems require the user to be physically proximal to the computer for operation.

25 US Patent 6,061,718 describes an e-mail delivery system for wireless communication system. However, this invention is limited to situations involving wireless transmissions over large distances using base stations. It is therefore targeted only at the mobile user segment and does not address the requirements of disabled users in a contained environment. Further more, this system does not enable the utilization of the full benefits and features available from an e-mail system when used directly on a computer.

Wireless Application Protocol (WAP) require Internet Service Provider (ISP), as an intermediary and are therefore limited. Further, such systems are useful only when communication is over a large distances and not in a contained environment.

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**The objects and summary of the invention:**

The object of the present invention is to overcome the above mentioned drawbacks and provide a system for remote access to e-mail facilities in a computer system through an audio support mechanism.

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To achieve the said objective, this invention provides a computing system consisting of a central processing unit, associated memory, input/output devices and containing an e-mail system which is characterized in that it includes a remote control device comprising :

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- means to convert speech to text;
- means to transmit the said text to the said e-mail system;
- means to receive text from the said e-mail system;
- means to convert the received text into speech; and
- means to select and access the received e-mail in the said e-mail system.

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The said remote control device (RCD) includes a means to display the received email messages.

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The said remote control device is customized by the user to speak aloud the sender, date, subject, e-mail content and attachment (if required) for incoming mail.

The said remote control device (RCD) includes means for selecting email messages or folder.

5 The said remote control device includes means for speaking aloud the summary of an e-mail folder.

The said remote control device is linked to the said computer through infra-red or ultrasonic or radio frequency waves.

10 The said e-mail system provides a speech announcement whenever new messages are received.

The said remote control device comprises:

- a microphone connected to the input of a microphone amplifier,
- 15 the output of said microphone amplifier is connected to the input of an analog to digital converter (ADC).
- the output of the said ADC is connected to one input of a processor means,
- a second input of said processor means is connected to a Read Only Memory (ROM) containing text-to-speech conversion and speech-to- 20 text conversion software,
- a first input-output of said processor means is connected to Random Access Memory (RAM) which contains the speech-to-text data, text-to-speech data, and command and status data,
- 25 one output of said processor means is connected to a transmitter for transmitting the said data in RAM to a remote computer containing an e-mail system,

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- another input of the said processor means is connected to a receiver which receives the data from said remote computer containing e-mail system,
  - another input-output of the processor means is connected to a control panel containing switches and display elements,
  - another output of the said processor means is connected to a digital to analog converter (DAC) which converts the data received after text-to- speech conversion into an analog signal and feeds to the input of an audio amplifier which drives a loud speaker to generate audible speech.

The said processor means is a digital signal processor, or a micro Controller or an ASIC.

The said ASIC includes the entire circuit except the microphone, speaker, computer containing e-mail system and control panel.

The said ASIC contains processing means ROM, RAM, transmitter and receiver.

This invention further relates to a computer program product residing on computer storage media containing computer readable devices embodied therein for causing a computer e-mail system to receive instructions and e-mail content from a remote control device and to send status and e-mail content to the said remote control device.

The said program product includes the facility for text-to-speech conversion.

This invention further includes a computing system consisting of a central processing unit, associated memory, input/output devices and containing an e-mail system, a method for remotely controlling the said e-mail system using an audio support comprising:

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**sending e-mail by :**

- receiving the speech input from the user,
- converting the speech input into the analog electrical signal,
- amplifying the said electrical signal and converting to digital form,
- converting the said digitized speech to text,
- transmitting the said text to the computer containing e-mail system,
- receiving the transmitted text in the computer containing e-mail system,
- transferring the said text to the said e-mail system,

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**receiving e-mail by:**

- transmission of data from computer containing e-mail system,
- receiving transmitted data at the remote control device,
- converting said received data from text to digitized speech,
- converting the said digitized speech to analog form,
- amplifying the said analog signal and converting to speech for the user.

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The email is selected through speech or through control panel.

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The received mail message is displayed on the said remote control device (RCD)

## **Brief Description of the Drawings:**

This invention will now be described with reference to the accompanying drawings.

- 5 Figure 1 shows the computing system having an e-mail system and remote control device and speaker-microphone according to this invention.

Figure 2 shows the remote control device according to this invention.

- 10 Figure 3 shows the electronic circuit in the said remote control device.

Figure 4 shows the block diagram of the software elements used in this invention.

## **15 Detailed Description of the Invention:**

- Referring to the drawings, Figure 1 shows the computer containing an e-mail system and having a separate remote control device (RCD) with speaker-microphone and a corresponding remote control unit (RCU) in the computing system. The said remote control unit (RCU) receives the signals transmitted by  
20 the said remote control device (RCD) and passes to the CPU for processing. Similarly, it receives the signals from the CPU and transmits to the RCD.

Figure 2 shows the remote control device (RCD) with its control panel.

- 25 Figure 3 shows the electronic circuit of the said remote control device (RCD). The output of microphone (1) connects to the input of microphone amplifier (2) which supplies an amplified signal to A - D converter (3). The output of the said A to D converter (3) is connected to the processor means (4). The said processor means can be a "digital signal processor" (DSP) or a micro-controller

or an ASIC. A first input of the said processor means is connected to ROM (5) containing text to speech conversion and speech to text conversion software (5.1 and 5.2 respectively). The one input-output of the said processor means is connected to RAM (6) which contains speech to text data (6.1, text to speech data 6.2 and commands and status data (6.3). A second input of the said processor means is connected to receiver (12) which receives data from the remote computer containing e-mail system. Another input-output of the said processor means is connected to the control panel containing switches and display (10). Another output of the processor means (4) connects to the input of D to A converter (7) which supplies analog signal to audio amplifier (8) which drives speaker (9) to produce audio output.

In figure 4 the remote control unit (RCU) resides in the computer system and interacts with the OS through Remote Control Unit Driver (RCUD). The RCU receives signals from the remote control device RCD and interacts with the OS Kernel which gives instructions to appropriate device and other sub-systems including the speech software and the e-mail software. The OS Kernel coordinates the transfer of the data from the e-mail system to the remote control unit device driver (RCUD). The RCUD operates the remote control unit (RCU) hardware to transmit and receive data to/from the distant hand held remote control device. The OS software is built in such a way that the drivers are supported by means of appropriate libraries with support function calls to such device.

The priority of the e-mail could be normal or urgent. An e-mail software could parse this information and provide the same to the user either by default or upon prompting. Another type of urgency information depends on e-mail contents. Here the user may be prompted for keywords or date and the e-mail software



can parse/search the e-mails for keywords and/or dates and provide appropriate information.

### **Working of the invention:**

5 User speech input is received by microphone (1), which converts the sound signals into electrical analog signals. These analog signals are amplified by microphone amplifier (2). The output from the microphone amplifier is converted by A —D converter (3) into digital signals. These digital signals are processed by processor means (4) using speech to text converter programme  
10 (5.2) contained in ROM (5) and converted to speech to text data (6.1) and stored in RAM (6). This data is then transmitted by transmitter (11) to the remote computer containing the e-mail system (13).

15 In the reverse process data transmitted by the e-mail system (13) is received by receiver (12) in the remote control device. The received data is processed by the processor means (4) using text to speech converter programme (5.1) contained in ROM (5) into text to speech data which is then stored in RAM (6). This data is further converted by D- A converter (7) into an analog signal which is applied to the input of audio amplifier (8) which drives speaker (9) to deliver  
20 output sound signals for the user.

Control panel (10) containing switches and display devices is operated by the user for providing commands to the system. The processor means (4) receives the commands from the control panel (10) stores as commands and status data  
25 (6.3) in the RAM (6) and transmits to the remote computer system through transmitter (11). It also receives status information from the remote e-mail system (13) through receiver (12) and displays on the control panel (10) for the user's information. The messages received from the remote computer can also be displayed on the remote control device (RCD). The control panel (10)

typically includes switches for turning the remote control device on/off and buttons for incrementing or decrementing selected e-mail number, instructing for reading e-mail header information. It may further include buttons for instructing reading of e-mail content and number selection buttons for pointing to e-mail messages by number, starting accepting spoken instructions and buttons for interrupting a particular activity.

In the computer containing the e-mail system, the data from the Remote Control Device (RCD) is received by Remote Control Unit (RCU) which is operated by the Remote Control Unit Device Driver (RCUD) software. The RCUD software then interacts with the OS Kernel (OSK) which transfers the received data to the e-mail system. In like manner, data sent by the e-mail system is transferred to the RCUD through the (OSK). RCUD then operates the RCU to transmit the data to the RCD.

The invention will now be described with reference to the following examples:

**Example 1.**

- Receive e-mail
- Update e-mail count
- Text to speech conversion
- Announce sender, subject, count of e-mail, urgency information
- Announce e-mail content if remote control device is used to instruct the same
- Detach attachments and announce text part if prompted

**Example 2.**

- User uses remote control device to point to latest unread e-mail
- The user can provide instructions to announce sender, subject, count of e-mail, urgency information

- The user can use the remote control device to point to the next unread e-mail and request similar information. Buttons on the remote control device enable this.

### 5 Example 3.

- User uses the remote control to point to the appropriate mail, subject wise, sender wise or count wise.
- The remote control prompts for the name of the sender or the text of the subject.
- The user announces it aloud at the remote control device which has a facility to record voice.
- The remote control device transmits this information to the device in the computer system where speech to text conversion occurs and the respective e-mail message is accessed.
- The user wants to send a reply to an e-mail and indicates so by using the remote control device.
- The remote control device prompts for sender, subject and content and attachment if any.
- The user provides the same and instructs to send the e-mail.

### ADVANTAGES:

This type of e-mail support is useful in the following scenarios:

- People with physical disabilities and who cannot move to or out of their work place very frequently.
- People who are blind can also use this system if they are trained to use the remote control device.
- This system will typically be most beneficial to reply/read short important messages. But is much better and more powerful than a cell phone or a

pager. That is because one can get all the power of e-mail whereas in the case of a cell phone one can only send a message to one person.

- While it may appear cumbersome or time consuming to expect a user to read e-mail content or attachment content, the facility is provided mainly to be used for short messages and for the sake of completion.
- In workplaces like construction sites, mines etc. users can do very well with just a hand held device and access e-mail and reply to the same.
- This invention can be used where there is no computer screen or monitor.
- This invention is different from the solutions provided based on WAP because it does not require Internet Service Provider (ISP) facility the remote control device is similar to the television remote control and its range has a distance limitation.

**We claim:**

1. A computing system comprising a central processing unit, associated memory, input/output devices and containing an e-mail system,  
5 characterized in that it includes a remote control device comprising :

- means to convert speech to text.
- means to transmit the said text to the said e-mail system
- means to receive text from the said e-mail system
- means to convert the received text into speech
- 10 - means to select and access the received e-mail in the said e-mail system.

2. A computing system as claimed in claim 1 wherein said remote control device (RCD) further includes a means to display the received email  
15 messages.

3. A computing system as claimed in claim 1 wherein the said remote control device is customized by the user to speak aloud the sender, date, subject, e-mail content and attachment (if required) for incoming mail.  
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4. A computing system as claimed in claim 1 wherein the said remote control device includes means for selecting email message or folder.

5. A computing system as claimed in claim 1 wherein the said remote control  
25 device includes means for speaking aloud the summary of an e-mail folder.

6. A computing system as claimed in claim 1 wherein the said remote control device is linked to the said computer through infra-red or ultrasonic or radio frequency waves.

7. A computing system as claimed in claim 1 wherein the said e-mail system provides a audio announcement whenever new messages are received.

5 8. A computing system as claimed in claim 1 wherein the said remote control device comprising :

- a microphone connected to the input of microphone amplifier,
- the output of said microphone is connected to the input of an analog to digital converter (ADC).
- 10 - the output of the said ADC is connected to the one input of a processor means,
- the second input of said processor is connected to a ROM (Read Only Memory) containing text-to-speech, conversion and speech to text conversion software,
- 15 - a first input-output of said processor means is connected to Random Access Memory (RAM) which contains the speech-to-text data, text-to-speech-data, and command and status data,
- one output of said processor means is connected to a transmitter for transmitting the said data in RAM to a remote computing system containing an e-mail system,
- 20 - another input of the said processor means is connected to a receiver which receives the data from the remote computing system containing e-mail system,
- another input/output of the processor means is connected to a control panel containing switches and display elements,
- 25 - another output of the said processor means is connected to a digital to analogue convertor (DAC) which converts the data received after text-to- speech conversion into an analogue electrical signal and feeds

to the input of an audio amplifier which drives a loud speaker to generate audible sound.

5 9. A computing system as claimed in claim 8 wherein the said processor means is a digital signal processor.

10. A computing system as claimed in claim 8 wherein the said processor means is a micro controller.

10 11. A computing system as claimed in claim 8 wherein the said processor means is an ASIC.

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15 12. A computing system as claimed in claim 11 wherein the said ASIC includes the entire circuit except the microphone, speaker, computer containing e-mail system and control panel.

13. A computing system as claimed in claim 11 wherein the said ASIC contains ROM , RAM ,transmitter and receiver.

20 14. A computer programme product residing on computer storage media containing computer readable devices embodied therein for causing a computer e-mail system to receive instructions and e-mail content from a remote control device and to send status and e-mail content to the said device.

25 15. A computer programme product as claimed in claim 14 wherein the said includes the facility for text-to-speech conversion.

16. In a computing system consisting of a central processing unit, associated memory, input/output devices and containing an e-mail system, a method for remotely controlling the said e-mail system using an audio support comprising:

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**sending e-mail by:**

- receiving the speech input from the user,
- converting the speech input into the analog electrical signal,
- amplifying the said electrical signal and converting to digital form,
- converting the said digitized to text,
- transmitting the said text to the computer containing e-mail system,
- receiving the transmitted text in the computer containing e-mail system,
- transferring the said text to the said e-mail system,

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**receiving e-mail by:**

- transmission of data from computer containing e-mail system,
- receiving transmitted data at the remote control device,
- converting said received data from text to digitized speech,
- converting the said digitized speech to analog form,
- amplifying the said analog signal and converting to speech for the user.

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17. A method as claimed in claim 16 wherein the email is selected through speech or through control panel.

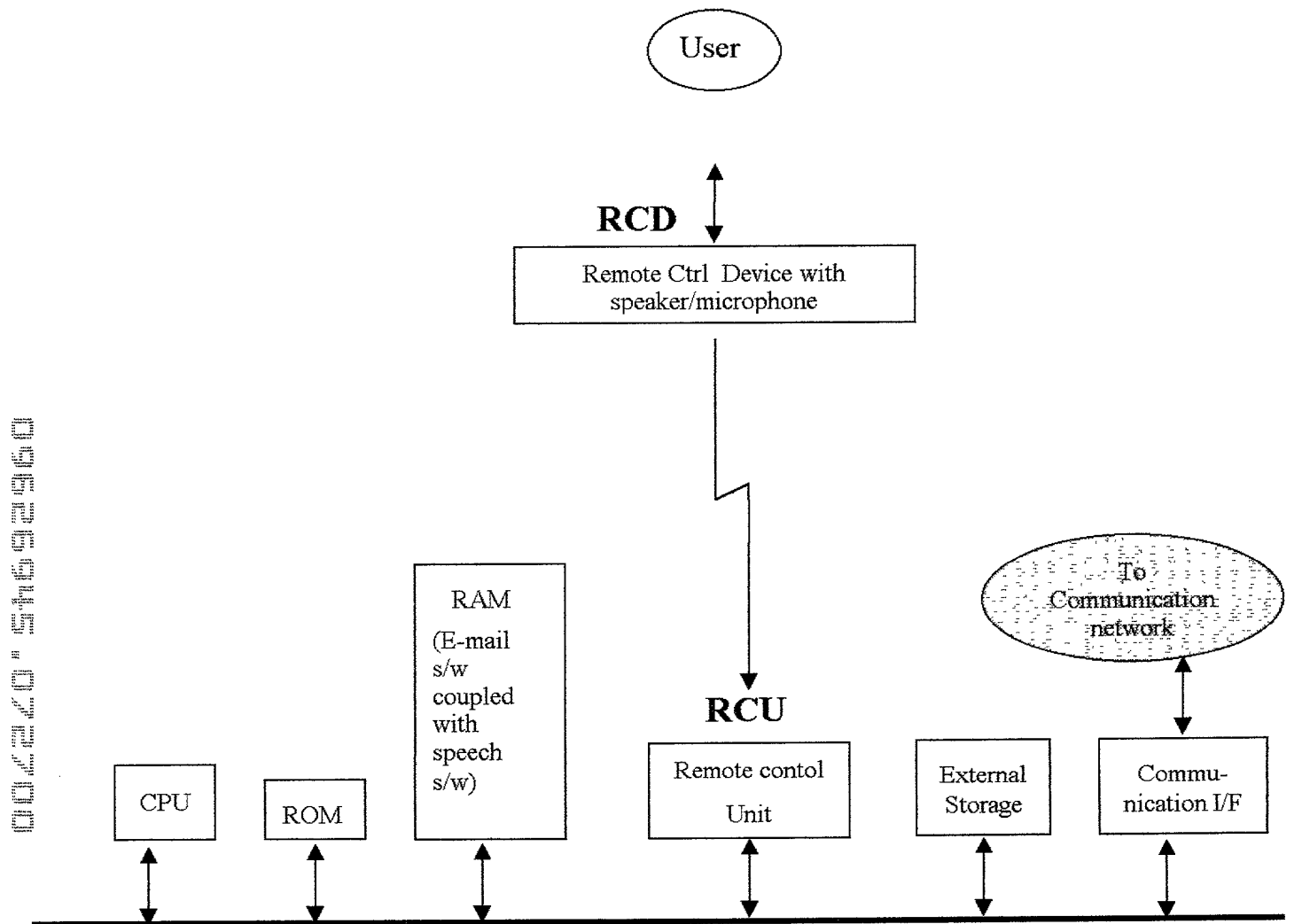
25

18. A method as claimed in claim 16 wherein the received mail message is displayed on the said remote control device (RCD)

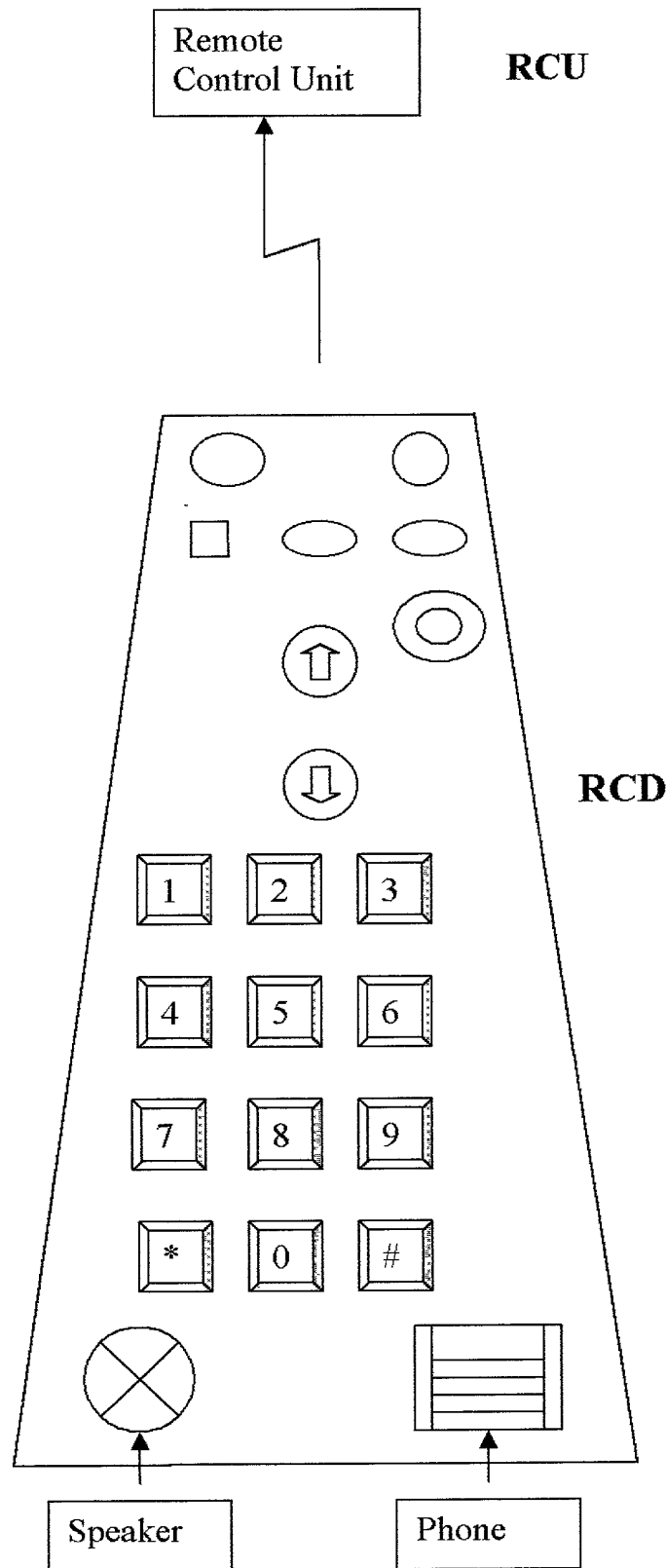


## ABSTRACT

This invention relates to an apparatus, program product and a method for controlling an email system in a remote computer using a remote control device  
5 having an audio support, speech-to-text and text-to-speech facilities.



**Figure 1**



**Figure 2**

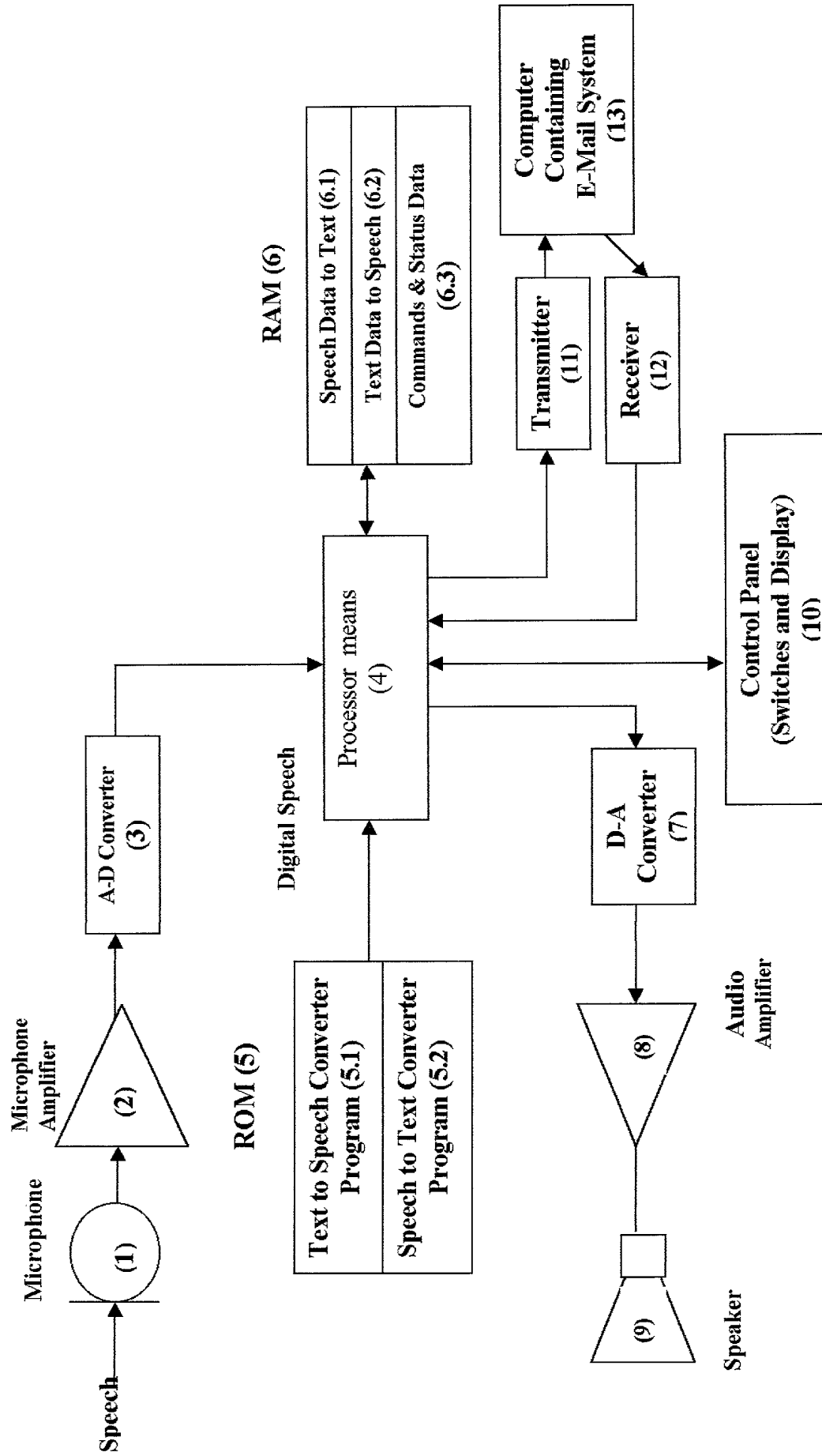


Figure 3

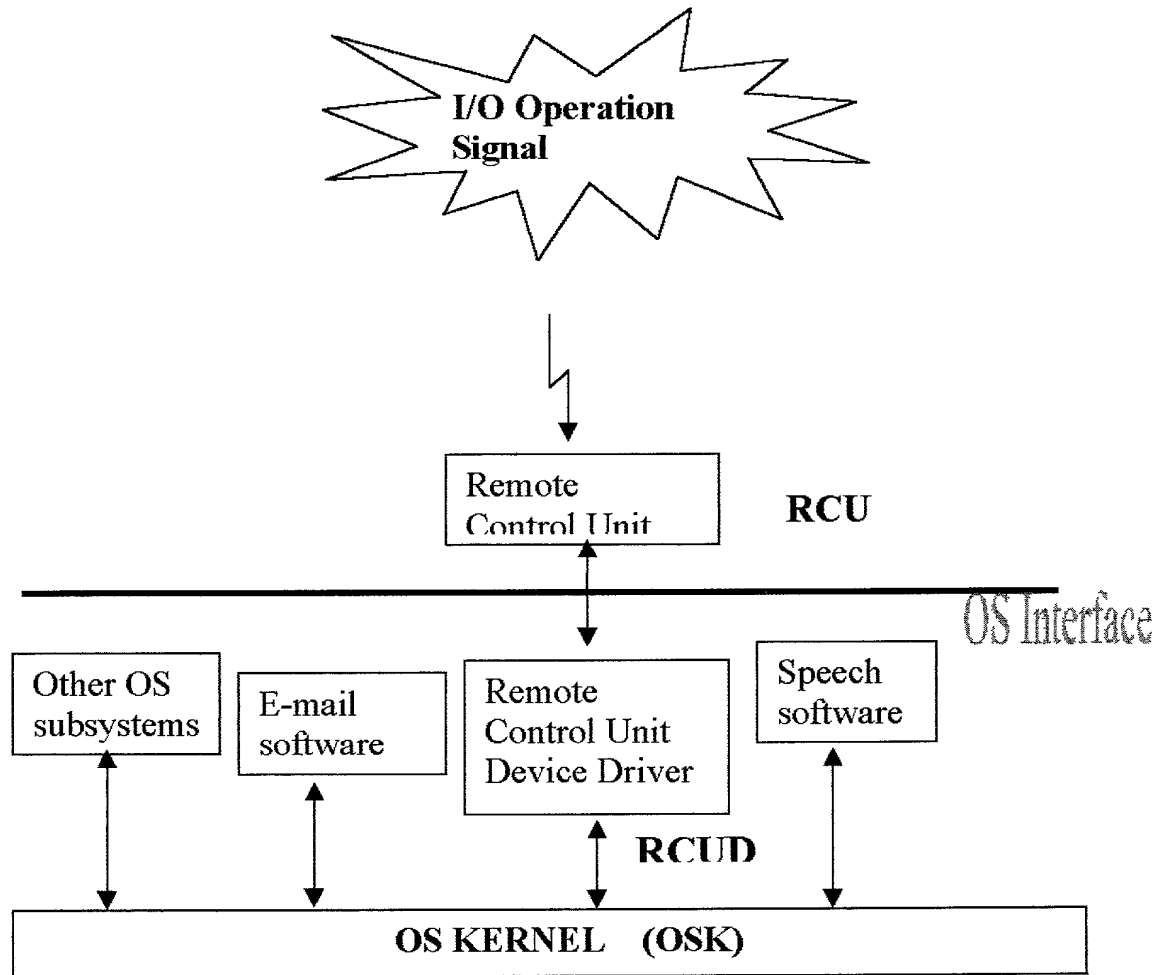


Figure 4